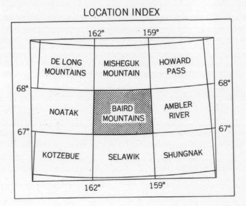
Base from U.S. Geological Survey, 1955

Geology modified from Karl and others, 1989
Manuscript approved for publication, October 31, 1990

SCALE 1:250 000

CONTOUR INTERVAL 200 FEET
DOTTED LINES REPRESENT 100 FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
1987 MAGNETIC DELINATION AT SOUTH EDGE OF SHEET VARIES FROM 19°30′ TO 22°00′ EAST



LOCATION INDEX

MAP A. DISTRIBUTION OF SITES FOR NONMAGNETIC HEAVY-MINERAL CONCENTRATE SAMPLES WITH HIGH-RANK SUMS FOR THE ELEMENT SUITE Ag, Pb, Zn, (±Ba)

CORRELATION OF MAP UNITS

Qd	QUATERNARY	CENOZOIC
Kd	CRETACEOUS	MESOZOIC
MzPzscm, MzPzm		MESOZOIC AND PALEOZOIC
MDc, MDd	MISSISSIPPIAN AND DEVONIAN	PALEOZOIC
Dcd	DEVONIAN	PALEOZOIC
Pzc, Pzd, Pzb, Pzp, Pzr, Pzcd, Pzbc, Pzpm, Pzsm, Pzscb		PALEOZOIC
PzPcm, PzPscm		PALEOZOIC AND PROTEROZOIC
Psm		PROTEROZOIC

DESCRIPTION OF MAP UNITS

- **Qd** — **Detrital deposits** (Quaternary)
- **Kd** — **Detrital rocks (Cretaceous)**—Sandstone, shale, and conglomerate
- **MzPzscm** — **Schist, carbonate rocks, and mafic rocks** (Mesozoic and Paleozoic)
- **MzPzm** — **Mafic rocks** (Mesozoic and Paleozoic)
- **MDc** — **Carbonate rocks (Mississippian and Devonian)**—Limestone and dolomite
- **MDd** — **Detrital rocks (Mississippian and Devonian)**—Sandstone, shale, and conglomerate
- **Dcd** — **Carbonate and detrital rocks** (Devonian)
- **Pzc** — **Carbonate rocks (Paleozoic)**—Limestone and dolomite
- **Pzd** — **Detrital rocks** (Paleozoic)
- **Pzb** — **Black rocks (Paleozoic)**—Carbonaceous shale, chert, quartzite, and minor limestone and volcanic tuff
- **Pzp** — **Pelitic schist** (Paleozoic)
- **Pzr** — **Rhyolite** (Paleozoic)
- **Pzcd** — **Carbonate and detrital rocks** (Paleozoic)
- **Pzbc** — **Black and carbonate rocks** (Paleozoic)
- **Pzpm** — **Pelitic and mafic rocks** (Paleozoic)
- **Pzsm** — **Schist and mafic rocks** (Paleozoic)
- **Pzscb** — **Schist, carbonate rocks, and black rocks** (Paleozoic)
- **PzPcm** — **Carbonate and mafic rocks** (Paleozoic and Proterozoic)
- **PzPscm** — **Schist, carbonate rocks, and mafic rocks** (Paleozoic and Proterozoic)
- **Psm** — **Schist and mafic rocks** (Proterozoic)

EXPLANATION

2 — Sample locality and boundary of associated drainage basin—Numbers are keyed to area descriptions in the text

- + Rank sum less than 80th percentile
- o Rank sum 80-85th percentile
- O Rank sum 85-90th percentile
- △ Rank sum 90-95th percentile
- ▽ Rank sum 95-98th percentile
- ◇ Rank sum greater than 98th percentile

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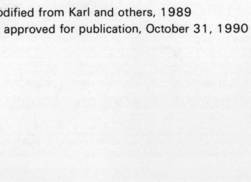

LOCATION INDEX

MAP B. DISTRIBUTION OF SITES FOR NONMAGNETIC HEAVY-MINERAL CONCENTRATE SAMPLES WITH HIGH-RANK SUMS FOR THE ELEMENT SUITE Co, Cu, (±Ag, Fe, Zn)

THE USE OF HEAVY-MINERAL CONCENTRATE DATA TO SHOW GEOCHEMICAL FAVORABILITY FOR ZINC-LEAD-SILVER AND COPPER-(COBALT) MINERAL OCCURRENCES IN THE BAIRD MOUNTAINS QUADRANGLE, NORTHWEST ALASKA

By
R.J. Goldfarb, E.A. Bailey, P.F. Folger, and J.M. Schmidt
1991

Introduction

The Baird Mountains quadrangle includes most of the Baird Mountains segment of the Brooks Range in northwest Alaska. The topography consists of moderately rugged peaks that rise 2,500-3,000 ft above lowlands located to the north and south of the quadrangle. Some peaks exceed 3,000 ft in elevation, with the highest point being Mt. Angayukaksraq at 4,760 ft. Streams drain north into the Noatak River and south to the Kobuk River. Tree line is at approximately 1,000 ft. There are no permanent roads or settlements within the quadrangle boundaries. Most of the quadrangle was incorporated into the Noatak National Preserve and Kobuk Valley National Park in 1978.

These maps are part of a series of publications on the Baird Mountains 1° x 3° quadrangle, prepared under the Alaska Mineral Resources Assessment Program (AMRAP). The simplified geology discussed below, and included on the accompanying maps, is generalized from Karl and others (1989). Cobb (1972, 1975), Cobb and others (1981), and Schmidt and Allegro (1988) have summarized known mineral occurrences in the quadrangle. A mineral resource assessment report of the area is presently in progress.

As part of the AMRAP study, a geochemical reconnaissance drainage survey was conducted in the Baird Mountains quadrangle. Resulting data are tabulated in Bailey and others (1987). A detailed statistical interpretation of these data and the identification of all anomalous regions are included in Folger and others (in press). Einaudi and Hitzman (1986) indicated that the area's sedimentary and (or) volcanic rock-hosted base-metal deposits are broadly syngenetic with their host rocks. Many of these deposits in northwest Alaska are enriched in zinc-lead-silver or copper-cobalt. The maps in this report use the geochemical data to delineate areas in the Baird Mountains quadrangle that are most favorable for the discovery of similar base metal deposits.

Geology and Mineral Deposit Types

The Baird Mountains quadrangle is underlain mainly by Paleozoic marine carbonate, pelitic, mafic, and clastic rocks (Karl and others, 1989). Most of these rocks were originally deposited in marine continental-shelf to slope environments (Dumoulin and Harris, 1986). Minor Paleozoic to Mesozoic mafic rocks crop out in the northwest part of the quadrangle and, in the northeast, Proterozoic schists and lesser intermediate plutonic rocks are structurally imbricated with Paleozoic metasedimentary units (Mayfield and others, 1982; Karl and others, 1989; Till, 1989). Most of the rocks of the quadrangle have undergone greenschist to blueschist facies metamorphism, with some amphibolite facies assemblages preserved in the Proterozoic rocks (Zayatz, 1987; Till, 1989). All of the rocks exposed in the Baird Mountains quadrangle have undergone folding and (or) thrust faulting, during the Jurassic to Cretaceous Brooks Range orogeny. The mineral occurrences known in the quadrangle include placer gold deposits, and several types of sedimentary- and lesser volcanic-rock hosted base metal sulfide deposits.

Two types of copper-rich deposits occur in the Baird Mountains and adjacent quadrangles: stockworks of copper sulfides in Paleozoic carbonate host rocks, and polymetallic volcanogenic massive sulfide deposits. Anomalous values of cobalt and less commonly silver and zinc occur with the copper-sulfide stockwork mineralization in limestone and dolostone at the Omar prospect in the Baird Mountains quadrangle (Degenhart and others, 1978, Folger and Schmidt, 1986; Folger, 1988). At Omar, chalcopyrite, bornite, and tetrahedrite/tennantite occur with minor pyrite in quartz-calcite veins that crosscut the carbonate host rocks. Similar, but more extensive mineralization occurs at the Ruby Creek deposit, 160 km to the southeast of Omar, in the Ambler River quadrangle. The Ruby Creek deposit also contains anomalous quantities of cobalt and zinc, with some pyrite and pyrrhotite, along with the predominant copper sulfides.

An example of the copper-rich volcanogenic massive sulfides is the polymetallic copper-zinc-lead-silver deposits, with locally associated barite, occurring in middle Paleozoic metarhyolite of the Ambler sequence, in the Ambler River quadrangle, east of the Baird Mountains. These deposits include the very large Arctic deposit (Schmidt, 1986) as well as several smaller occurrences (Hitzman and others, 1986). The geology of the Baird Mountains quadrangle is permissive for the existence of similar massive sulfide occurrences. Copper anomalies with a large alteration zone located at Kivivik Creek in the northwest part of the Baird Mountains quadrangle suggest that volcanogenic massive sulfides of a different type may be hosted in those late Paleozoic or early Mesozoic mafic rocks (Ellersieck and others, 1984; Karl and others, 1985; Schmidt and Allegro, 1988).

Two types of zinc-lead-silver-enriched base-metal sulfide deposits are known from the Baird Mountains and adjacent quadrangles. Veins, stockworks, and disseminations of sphalerite and galena, with barite, minor pyrite, and associated silver anomalies occur at Frost (Degenhart and others, 1978) and Powdermilk (Schmidt and Folger, 1986) within the Baird Mountains quadrangle. Host rocks are dolostones and limestones of early to middle Paleozoic age (Dumoulin and Harris, 1986). Stratabound massive sulfide deposits of zinc, lead, and silver, with variable pyrite and barite, are hosted in Carboniferous black siliceous shales across the western Brooks Range. These deposits include the world-class Red Dog (Moore and others, 1986), and nearby Lik (Forrest, 1983; Forrest and others, 1984) deposits in the DeLong Mountains quadrangle, northwest of the Baird Mountains, as well as the Drenchwater Creek deposit (Nokleberg and Winkler, 1982) in the Howard Pass quadrangle to the northeast. At Ahua, and in the Kilyaktalik Peaks area in the northwest part of the Baird Mountains quadrangle, anomalous values of silver, and less consistently of zinc and copper, occur with disseminated to massive pyrite-marcasite in Carboniferous carbonaceous black shale.

Geochemical Sampling and Analytical Procedures

Heavy-mineral concentrate samples were collected at 1,185 sample sites on small-order drainages within the Baird Mountains quadrangle. By concentrating heavy minerals (including detrital sulfide grains) prior to analysis, the likelihood of detecting base metal anomalies is enhanced. Samples were collected using a standard gold pan and were sieved, while in the field, through a stainless steel 10-mesh (2-mm opening) screen. Commonly, 3-4 kg of minus-10-mesh composited sediment were collected to yield the desired 30-60 g of concentrate.

In the laboratory, the samples were air dried and sieved to minus-35mesh. Light-weight material in the concentrates was separated by allowing the heavier fraction to settle through bromoform (specific gravity 2.8). The resulting heavy-mineral fractions were separated into nonmagnetic, semi-magnetic, and magnetic fractions using a Frantz Isodynamic Separator[1]. The nonmagnetic fraction was pulverized in an agate mortar prior to analysis. Each nonmagnetic heavy-mineral concentrate sample was analyzed semiquantitatively for 31 elements, using an optical emission spectrograph, according to the method outlined by Grimes and Marranzino (1968).

Areas of Geochemical Favorability for Base Metal Mineral Occurrences

A major objective of the AMRAP study was to accumulate broad-scale data to define regional geochemical patterns that relate to mineral resources. The accompanying geochemical maps identify clusters of anomalous concentrate samples that may delineate areas containing specific types of base-metal-rich mineral systems. Geochemical signatures for carbonate-hosted occurrences such as Frost and Powdermilk, as well as for shale-hosted deposits such as Red Dog, should be dominated by a zinc-lead-silver element suite, with locally anomalous barium. Mineral occurrences similar to those at Omar and Ruby Creek would be expected to yield copper-cobalt anomalies in downstream sediments. Silver, iron, and zinc anomalies might be localized around many of the copper-rich ore systems.

Statistical data for individual element distributions are given by Folger and others (in press). They selected geochemical thresholds by identifying distinct breaks in the frequency distribution of the data, as close as possible to the 95th percentile. Table 1 lists concentration ranges that were defined as anomalous for the elements of interest in heavy-mineral concentrate samples discussed in this report.

[1]Use of trade names in this report is for desciptive purposes only and does not constitute endorsement by the U.S.G.S.

Table 1.--Anomalous concentrations of metals in heavy-mineral concentrate samples

Element	Lower limit of anomalous concentration (ppm)	Maximum concentration reported (ppm)	Percentile
Ag	1	5,000	85
Pb	500	>50,000	80
Zn	1,000	>20,000	78
Ba	>10,000	>10,000	73
Co	100	500	92
Cu	200	7,000	91
Fe	70,000	300,000	94

The non-parametric RANK program (Goldfarb and others, 1983) was used to help identify anomalous element suites, rather than single element anomalies. This program places the analytical data for each desired variable (element) into a vector of ascending order. The rank of any sample is simply its position in the order. Thus, the smallest data value for each variable has a rank of "1", and the largest has a rank of "n", where "n" equals the total number of samples. When equivalent rank values occur for more than one sample, they are assigned the mean of the ranks they would have had if they had been distinct. The ranks can be summed for each sample for any suite of elements believed to be related to a particular mineral deposit type. The net effect of this procedure is to transform any number of separate element distributions into a single unitless distribution that represents a total metal signature for the summed elements.

Rank-sum vectors were calculated for Ag+Pb+Zn+(Ba/2) and for Co+Cu+(Ag/2)+(Fe/2)+(Zn/2). Because barium in the former case and silver, iron, and zinc in the latter case are elements that are less consistently anomalous at many of the known deposits, they were intentionally weighted less than other elements within the respective suites, by dividing their rank values by two prior to summing the ranks. The rank-sum vectors were then divided into six percentile classes with upper limits of 100, 98, 95, 90, 85, and 80. Geographic groups of sample sites with the higher percentiles are located on the accompanying maps.

Zinc-Lead-Silver-(Barium)-rich Anomalies

Seven areas are delineated as geochemically favorable for zinc-lead-silver-(barium) base metal sulfide occurrences. Area A1 is located in the western headwaters of the Omar and the North Fork of the Squirrel Rivers. It is underlain by limestone, dolostone, and calcareous siltstone of the Cambrian to Devonian Baird Group (Tailleur and others, 1975; Karl and others, 1989). Dolostones within area A1 host the sphalerite-galena ± pyrite, barite) mineralization at Powdermilk (Schmidt and Folger, 1986) and the barite (± sphalerite and galena) mineralization at Frost (Degenhart and others, 1978). These two mineral occurrences and the nearby carbonate-hosted, copper mineralization at Omar, all located in the southern part of area A1, are the most significant mineral occurrences discovered to date in the Baird Mountains quadrangle.

Samples with the most anomalous rank-sum values within area A1 are located near the Powdermilk prospect; sample values are not as highly anomalous near the more barite-rich Frost prospect to the northeast. Samples with anomalous values in all directions away from the Omar prospect suggest that additional zinc-lead-silver-rich mineral occurrences may exist near Omar or that a zinc-lead-silver halo may occur around the deposit.

Whereas many samples in the north half of area A1 are characterized by anomalous rank-sum values, no zinc-lead-silver-(barium) occurrences are known in this area. However, malachite-chalcopyrite-iron oxide-bearing quartz float with barium concentrations of greater than 5,000 ppm was found to the northeast, near the divide with Nakolik River (Zayatz and others, 1988). Further west, within the headwaters of the North Fork of the Squirrel River, pyrite veinlets and disseminations are common in both clastic and carbonate rocks. Also, Zayatz and others (1988) report a silver- and copper-rich zone in marble (Schmidt and Allegro, 1988, mineral occurrence #85) near some of the anomalous samples in area A1. It is possible that some of the sediment-hosted copper and iron mineralization observed within the north part of the area may be spatially associated with unknown sphalerite-, galena-, and (or) barite-bearing occurrences. However, there is little evidence to indicate any genetic relationship between such unrecognized zinc-lead-silver-(barium) occurrences and known iron and copper occurrences. Probably the different deposit types just occur in the same general region.

Area A2 is the largest area in the quadrangle delineated as favorable for zinc-lead-silver-(barium)-bearing mineral occurrences. It is located in the west-central part of the quadrangle and covers a large part of the Eli and Agashashok Rivers watersheds. Area A2 is underlain by structurally imbricated Devonian through Mississippian carbonate and clastic rocks assigned to several different formations (Karl and others, 1989). Karl and others (1985) report a quartz vein with minor sphalerite crosscutting limestone less than 1 mi to the south of the Eli copper prospect (a quartz-chalcopyrite vein; Cobb and others, 1981) between the headwaters of the Eli and Agashashok Rivers. Although localized iron staining and quartz veining characterize a large part of area A2, no other mineral occurrences containing sphalerite, galena, or barite are known. Samples with the most anomalous geochemical values occur in the southwest corner of area A2. The most likely model for zinc-lead-silver deposits in this area is that of stratabound sandstone-hosted (Laisvall-type) lead-zinc.

Area A3 on the north and northwest edges of the Kilyaktalik Peaks contains 3 samples with anomalous zinc-lead-silver-(barium) rank values. Area A3 is underlain by Devonian and Mississippian sandstones of the Endicott Group and Mississippian black shale and limestone. Barite porphyroblasts occur in minor exposures of overlying Pennsylvanian to Permian cherts, and possible sphalerite has been recognized in the black shale at one locality (Schmidt and Allegro, 1988, #12). The Mississippian rocks within area A3 are highly favorable for the occurrence of stratiform massive sulfide deposits of zinc-lead-silver-(barium).

The south side of the Noatak River, extending for approximately 8 mi from the Angayukalik Hills to the Okiotak Creek watershed, has been delineated as area A4. It is underlain by undivided Late Devonian and Mississippian rocks of the Endicott Group, which includes the Hunt Fork Shale and Noatak Sandstone. The U.S. Bureau of Mines (1978) has described barite float occurring to the south of the Angayukalik Hills. Schmidt and Allegro (1988) list a number of disseminated pyrite and pyrite-bearing quartz vein occurrences within area A4. Stratabound sandstone-hosted lead-zinc is the most likely model for base-metal zinc-lead-silver-(barium) occurrences in area A4. Additionally, some of the anomalies may reflect anomalous lead and zinc concentrations within sandstone-hosted ironstone nodules. Schmidt and Allegro (1988, #17) report such an occurrence on the west edge of area A4 that contained 150 ppm lead and 270 ppm zinc.

Three other small areas (A5, A6, A7), within the northeast part of the Baird Mountains quadrangle, are also defined by the presence of samples with anomalous zinc-lead-silver-(barium) rank-sum values. Undivided strata of the Endicott Group underlie area A5, located about 3 mi northwest of Kanaktok Mountain. Paleozoic carbonate rocks and quartz sandstones are the dominant lithologies within area A6, where a single site is extremely anomalous on the north side of Kanaktok Creek, about 6 mi north of Mt. Angayukaqsraq. Quartz veins and pods with local iron- and copper-bearing sulfides occur near both areas (Schmidt and Allegro, 1988), but no other base-metal occurrences are yet known. Area A7 is defined by 2 highly anomalous concentrate samples collected north of Nanielik Creek. The associated two small drainage basins are underlain by interbedded Paleozoic marbles, black shales, clastic sedimentary rocks, and subordinate rhyolite. The source of the geochemical anomalies is uncertain, and there is no clear association with the disseminated fluorite found in rhyolite (Schmidt and Allegro, 1988, #40), upstream from the sample sites.

Copper-Cobalt-(Silver)-(Iron)-(Zinc)-rich Anomalies

Twelve areas have been delineated within the Baird Mountains quadrangle that show geochemical favorability for copper-cobalt-(silver)-(iron)-(zinc) mineralization. Nonmagnetic heavy-mineral concentrate samples from these areas consistently contain an abundance of iron- and copper-bearing sulfide minerals. Most of these areas are underlain by middle Paleozoic clastic and carbonate rocks, and are located between latitudes of about 60° 25′ and 60° 45′ and longitudes of 160° and 162°.

Area B1 is the upper half of the Tukpahlearik Creek watershed. It is underlain by mixed Paleozoic pelitic schists, marbles, cherts, and black quartzose schists (Karl and others, 1989). Disseminated pyrite has been noted in the clastic rocks within area B1, especially within the black siliceous rocks. The anomalous geochemical values may reflect elevated metal concentrations in the metamorphosed black shales and cherts, which also have a potential for stratiform massive sulfide mineralization.

The western headwaters of the Omar River, area B2, contain mixed carbonate and clastic rocks of Middle Devonian age and Cambrian to Devonian carbonate rocks of the Baird Group. Copper-bearing minerals occur most commonly within the carbonate rocks, including the limestone and dolostone at Omar that host chalcopyrite, bornite, and tetrahedrite stockworks, veins, and disseminations. Three parts of area B2 contain concentrate samples that are highly anomalous for the copper-cobalt-(silver)-(iron)-(zinc) signature. First, some anomalous samples occur near the Omar prospect. Second, 5 mi south of Omar, several anomalous samples occur in the southwest corner of area B2. Third, several anomalies are located along the Omar River east of the Frost barite occurrence. Samples collected within the smaller watershed containing Frost, however, are not anomalous in rank-sum values.

Mixed carbonate and clastic rocks of Paleozoic age also underlie area B3, within western tributary basins to the central part of the North Fork of the Squirrel River. To date, no mineral occurrences have been identified within this area. However, approximately 3 mi west of the most anomalous sample site in area B3, some alteration is associated with pyrite and traces of copper-bearing minerals (Schmidt and Allegro, 1988, #151).

Area B4 comprises the central Agashashok River basin, the extreme west part of the Squirrel River basin, and the divide in between them. The southeast part of area B4 is underlain by carbonate rocks of the Baird Group. The northwest part of the area is underlain by Late Devonian and Mississippian rocks of the Hunt Fork Shale and Noatak Sandstone. Mixed carbonate and clastic rocks form the divide. Sulfide minerals, mainly pyrite and chalcopyrite, have been noted as cement in the sandstones and as bands of disseminated pyrite, as well as in small quartz veins in all of the rock types.

Some of the most highly anomalous samples are located along the southernmost tributary of the Eli River. These anomalies delineate area B5 and may reflect minor pyrite, malachite, chalcopyrite, and (or) bornite within quartz veins that crosscut shaly and silty beds of the Endicott Group. Silver and cobalt are also sometimes anomalous in the iron- and copper-enriched vein samples (Zayatz and others, 1988). A number of mineralized outcrops (Karl and others, 1985), including the Eli prospect, contain pyrite, chalcopyrite, and (or) sphalerite that occur in veins that crosscut limestones in the headwaters of the watershed. But samples immediately downstream from the carbonate rocks are not strongly anomalous. Therefore, the highly anomalous samples lower in elevation within the watershed are believed to reflect mineralization within the clastic, and not the carbonate rocks.

Area B6, within the western headwaters of the Nakolik River, is underlain by the Hunt Fork Shale and interbedded carbonate and clastic rocks. Outcrops of carbonate rocks within this area are often iron-oxide stained or contain minor amounts of pyrite. Schmidt and Allegro (1988, #85) report a chalcopyrite occurrence in marbles 0.5 mi south of area B6. The eastern tributary to the Nakolik River and the region extending eastward to Nakolikurik Creek (area B7) contain numerous samples with anomalous copper-cobalt-(silver)-(iron)-(zinc). These anomalies, like those of areas B4-B6, may be derived from either quartz vein-hosted or disseminated mineralization in the Late Devonian to Mississippian phyllites and sandstones of the Endicott Group.

Further east, a number of smaller areas are also favorable for both disseminated and quartz-hosted copper-cobalt-(silver)-(iron)-(zinc) mineralization. Interbedded schists and phyllites of Paleozoic age underlie areas B8 and B9 in the northwest headwaters of the Salmon River. Three small areas near the east edge of the Baird Mountains quadrangle, areas B10-B12, are underlain by Paleozoic phyllites, metaclastic rocks, and carbonate rock; samples from these areas show anomalous copper-cobalt-(silver)-(iron)-(zinc) rank-sum values. Area B11, in upper Nanielik Creek, contains black shale with pyrite and chalcopyrite (Schmidt and Allegro, 1988, #126-132). Specific copper deposit models cannot be indicated from anomalous samples in areas B8-B12 without additional geologic information, but may include both stratabound disseminated and vein types.

Conclusions

Sediment-hosted base-metal sulfide deposits are the most probable deposit types likely to occur within the Baird Mountains quadrangle. Both copper and zinc-lead-silver mineralized systems are known, and similar types of occurrences are the most probable targets for further exploration. Rank-sum statistical techniques applied to regional stream-sediment concentrate data have delineated seven areas that are favorable for zinc-lead-silver mineralization and 12 areas favorable for copper-cobalt occurrences. Overlapping areas, containing both geochemical suites, include the Omar River region (A1, B2), the Eli-Agashashok River drainage basins (A2, B3-B5), and a small region north of Nanielik Creek (A7, B12). Additional areas that are geochemically favorable for zinc-silver-lead occurrences include a large area south of the Noatak River (A4), the north to northwest side of Kilyaktalik Peak (A3), a region northwest of Kanaktok Mountain (A5), and a small area north of Mt. Angayukaqsraq (A6). Other areas favorable for copper-cobalt-dominant occurrences are the upper Tukpahlearik Creek watershed (B1), the higher elevations of the Nakolik River watershed (B6, B7), the headwaters of the Salmon River (B8, B9), and two small regions on the east edge of the Baird Mountain quadrangle (B10, B11).

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